

was the finding of the islands of Porto Santo and Madeira, in 1418-20, by two squires of his own household, who were driven thither, by a storm off Cape St. Vincent. Mr. Major has, however, proved satisfactorily, we think, that the Madeira group were discovered about the end of the previous century by an adventurous Englishman named Robert Machin.

For long had Cape Bojader proved an obstacle which the Portuguese sailors sent out by the Prince attempted in vain to pass; Cap Nun had been passed, but the increasing violence of the waves that broke upon the dangerous northern bank of Cape Bojader proved too much for the cockle-shells in which Prince Henry's explorers were hardly enough to risk their lives. It was only in 1434 that Gil Eannes, a native of Lagos, managed to pass this fancied terrible obstacle to progress, by putting well out to sea. Next year another fifty leagues were added to the stretch of coast discovered, and thus year after year, league upon league was added, and specimens of the people and products brought home, the former to be Christianised and sent back to convert their brethren. By the time of Prince Henry's death in 1460, the west coast of Africa had been explored under his auspices as far south as the Rio Grande, the Canaries, Cape Verde Islands, and Madeira discovered or rediscovered, and a large amount of substantial information obtained about the people, the products, and the country far into the interior of Northern Africa.

Mr. Major justly designates Prince Henry the originator of continuous modern discovery, for Portuguese enterprise in this direction was not stopped by his death. It was not, however, till 1471 that the equinoctial line was crossed for the first time within the memory of man, probably by an explorer named Lopo Gonsalvez. The equator was not much surpassed till Diego Cam set out in 1484 and discovered the mouth of the Congo; the celebrated Martin Behaim, the inventor of the application of the astrolabe to navigation, was with Diego Cam in this eventful voyage. In his next voyage Diego got as far south as Cape Cross in 22° south latitude, where the cross he planted is still to be seen in almost complete preservation. In 1486 Bartholomew Diaz was sent out by King João, of Portugal, to carry out the discovery of the African coast, and, without knowing it, passed the southernmost part of Africa and came to anchor in what is now known as Flesh Bay, near Guaritz river, to the east of Cape Agulhas. He turned back after reaching the mouth of the Great Fish river, and it was on this return voyage that he discovered what he called Cape Tormentoso, but which King João on his return, "foreseeing the realisation of the long-coveted passage to India," named Cape of Good Hope. It was not till ten years after this that a practical test was made of the utility of this passage to India. Vasco da Gama left Lisbon with four vessels, the largest not exceeding 120 tons, in July, 1497, and coasted south the west coast, and north the east coast of Africa, as far as Melinda, to the north of Mombassa, which was reached in April of the following year. On April 20, 1498, he sailed for Calicut, before which he anchored on May 20, thus discovering the famous "Cape route" to India.

Such are a few of the results which are directly or indirectly due to the far-seeing enterprise and noble-mindedness of Prince Henry the navigator. But these are

not all. But for his initiative in the beginning of the century, it is doubtful if America would have been discovered at the end of it, and had Prince Henry been alive when Columbus began his memorable agitation, that greatest of explorers would doubtless have been saved much humiliation and misery. Magellan's circumnavigations fall also within this most eventful of eras, and not far beyond it, Mr. Major has proved, the discovery of Australia. "The coasts of Africa visited, the Cape of Good Hope rounded, the New World disclosed, the sea-way to India, the Moluccas, and China laid open, the globe circumnavigated, and Australia discovered within one century of continuous and connected exploration," begun and to a great extent carried out by the prince the story of whose life Mr. Major has told so well. We can only again commend his work and that of Peschel to our readers as not only full of interest but of much valuable information.

OUR BOOK SHELF

Chemical Handicraft. A Classified and Descriptive Catalogue of Chemical Apparatus suitable for the performance of Class Experiments, Research, and Chemical Testing. Second Edition. By J. J. Griffin, F.C.S. (Published by the Author, Garrick Street.)

MR. GRIFFIN, the well-known manufacturer of scientific apparatus, earned the thanks of all students of science in this country by the publication of his first catalogue, now some eleven years ago, when the condition of things was much less far advanced than it is now. He has earned still greater thanks for his last edition, which is much more complete, more copiously illustrated, and more carefully brought up to the present needs of the student and the present possibilities of the maker. Those who noticed the many collections of such apparatus at South Kensington, last year, among which was one sent in by the Messrs. Griffin, cannot have failed to have been struck by the complication of the apparatus now required for chemical researches, and the skill, both in glass and brass, required to produce them. Mr. Griffin is evidently doing his best to uphold English manufactures against his continental rivals, and we wish him and his book every success. As the madman said of the dictionary, it is not light reading, and the plot is feeble; but, nevertheless, the book will be of use in every laboratory.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

The Cretaceous Flora of America

I AM extremely obliged to Dr. Newberry for pointing out in a very kind manner what is the actual state of our knowledge at the present time respecting the American cretaceous beds. Never having travelled in America, nor having had the honour of conversing with any of the American savants who have investigated the remains in these beds, I am scarcely in a position to discuss with them the value of the evidence on which they have been considered cretaceous. I have, however, endeavoured to make myself acquainted with the literature of the subject, and had read most of the works mentioned by Prof. Newberry in his letter to NATURE. I in no way dispute that dicotyledonous leaves have or may be found in cretaceous strata,

but have, on the contrary, endeavoured partially to account for their absence in British cretaceous rocks. The age of the supposed American cretaceous beds appear to me, however, to be determined principally from the presence of Ammonites, Hamites, and other dibranchiate cephalopoda, and other types of mollusca as *Inoceramus*. Now what I intended to imply was that the presence of these is not conclusive evidence that the beds in question are as old as our chalk. Between our chalk and the base of our eocene a great hiatus exists, during which almost the whole of the cretaceous fauna became extinct, at least in European seas. This extinction and complete change of fauna implies an immense interval of time which, although we have but little record of it in Europe, we may expect to find recorded elsewhere.

It is at least possible that the series in question in America may be this record. In the lower, as in the Dakota group, we have, mixed with many decidedly (as we have been wont to consider them) cretaceous types of cephalopods, gastropods and bivalves of an eocene aspect. No comparative tables of fossils nor determinations of any value of European species from these beds have been made. But assuming that a portion of the lowermost cretaceous rocks of America were synchronous with some of our upper European cretaceous rocks, we may still suppose the mass of the strata to be of younger age. As very fairly stated by Dr. Newberry, Mr. Lesquereux does not agree with him as to where the division between cretaceous and eocene in the lignitic beds should be placed. Hayden says that the age of the lignite strata is obscure. "The evidence points at the present time to the conclusion that the lower portions of this group are cretaceous, passing up by gradual transition into the tertiary, and that the greater portion may be regarded as of the age of the later period." Cope and Marsh, again, from the presence of *Mesosaurus*, considered the lignites to be cretaceous. It seems to me that as the lignitic flora has the same character throughout its entire thickness, the formation must be considered as a whole, and that instead of endeavouring to correlate portions with either the European chalk or eocene, it would be simpler for American geologists, and more in accordance with the evidence we possess, to recognise the fact that the American series more or less represents the great hiatus existing in Europe between these formations. Although the upper portion of the lignites, the total thickness of which has been estimated at 10,000 feet, may be contemporaneous with a part of our eocene, the absence of any of the types of eocene flora, such as are characteristic at Sezanne, Bournemouth, &c., is opposed to the supposition, as much as the absence of anything at all approaching the Dakota flora in our cretaceous rocks is opposed to the contemporaneity of the latter.

These series may still, however, be conveniently spoken of relatively, and for the purposes of American geology, as cretaceous, but not until further evidence is adduced can they be recognised as synchronous with any portion of ours.

J. S. GARDNER

Automatism

MR. SPALDING in his able review of "The Physical Basis of Mind," alludes to the term automatism, about which there has been so much controversy. The word, however, is a most unsuitable one for designating the important doctrine inculcated so clearly by Mr. Spalding, as well as by Huxley and Clifford. The ordinary meaning of "automaton" is a machine whose actions are unattended by feeling. Now as the most striking difference between an organic machine and an inorganic one is that the movements of the living machine are accompanied by sensations, while those of the inorganic machine or automaton are without concomitant sensations, it is plainly a mistake to apply to the actions of the sentient machine a term which has as a fundamental part of its meaning the absence of sentience. The incongruity is so manifest that I think it not improbable that it is one of the sources of the facile confidence displayed by some of the opponents of "automatism"; and if the word were supplanted by a less objectionable one, it is possible that the important doctrine intended to be designated by it might be accepted with less difficulty. I would suggest that some word meaning concomitant action or synchronous procedure might be coined for the purpose. The Germans, who are so fond of long, amalgamated expressions, would perhaps use something like "associated—mutually inconvertible—processes" to designate

* "Geological Survey of Territories," 1872.

ate this dual unity of the subjective and objective sides of mental action.

D. SHARP

Thornhill, Aug. 5

Local Museums

In common with Mr. Allen, and doubtless very many others, I have read the articles and letters on Local Museums with a great deal of pleasure; and I am very glad that Mr. Allen has made his practical suggestion. In February last, in a paper which I read before the Hastings Philosophical Society on "Local Museums and Libraries of Reference," I made a similar suggestion for our own locality. You may think the matter of sufficient importance to justify the insertion of the following few lines from my paper:—

"I do not wish to put such institutions as I am advocating into competition with things of a very different character; but I would ask whether a zeal somewhat akin to that which is exhibited in raising funds for religious societies ought not to be exhibited on behalf of such purposes as those under discussion? Would it be at all absurd to talk about having a *mission* to establish a public library? . . . For my own part I can conceive of few nobler aims than that of raising for one's town a permanent public institution of an intellectual character. If a committee were to take up the work with enthusiasm and were able, even though after many years of toil, to say to the people of Hastings: 'We have built for you, with your own help, a library and museum, and we have, with funds with which the public have supplied us, sufficiently endowed this institution to carry on all its legitimate work, and we now hand it over to you, the people of the town of Hastings, as the property of you and your children for ever'—I say a committee that took in hand and accomplished such a work would deserve the deepest gratitude of the borough, and would have a right to claim to have accomplished a *mission* of no small importance." A. R.

Hastings, August 3

July Shooting Stars

I OBSERVED 197 shooting-stars in July—nearly all of them between the 6th and 20th—in twenty-four hours of watching. The weather was generally very cloudy and stormy between the 13th and 23rd, or many more would have been seen. I looked usually towards the eastern sky, and from the considerable number of meteor paths registered, am enabled to give the following table of radiant points visible in that quarter during the period of my observations. The list may be considered very fairly complete and accurate, for the great majority of the meteors were well seen, and many of them had short courses evidently near their radiant centres:—

Approx. Star.	Radiant Point.			No. of Meteors.
	R.A.	Dec.		
ρ Cassiopeiae...	349	+ 53	...	8
β Aquarii ...	317	- 11	...	13
χ Aquarii ...	336	- 7	...	5
ι Pegasi...	333	+ 26	...	8
ζ Pegasi...	338	+ 11	...	11
f Lacertæ ...	334	+ 43	...	7
σ Andromedæ ...	4	+ 35	...	21
θ Persei...	36	+ 47	...	6
ϵ Cygni ...	313	+ 33	...	6
α Cygni ...	315	+ 48	...	8
ζ Cassiopeiae...	6	+ 53	...	11
δ Cygni ...	290	+ 43	...	9
$\alpha\beta$ Persei ...	47	+ 45	...	5
θ Antinöi ...	298	- 8	...	5
δ Ursæ Minoris ...	295	+ 85	...	6
π Herculis ...	258	+ 37	...	6
σ Draconis ...	280	+ 57	...	5
λ Antinöi ...	285	- 12	...	5
ι Andromedæ ...	350	+ 37	...	7

I have given the number of meteors conformable to each position, but this detail cannot be very precise, inasmuch as in several instances the path converged back on two radiants in the same line, and near together. In such cases it is often quite impossible to assign the true focus. Of the nineteen showers included in the list, sixteen of them come near the dates and places of radiants enumerated in Mr. R. P. Greg's catalogues.